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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,374	02/18/2004	Brian A. Franchuk	E252.12-0006	2804

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EXAMINER	
DUONG, FRANK	
ART UNIT	**PAPER NUMBER**
2666	

DATE MAILED: 05/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/781,374	FRANCHUK ET AL.	
	Examiner	Art Unit	
	Frank Duong	2666	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 February 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/18/04, 5/19/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is a response to communications dated 02/18/04. Claims 1-21 are pending in the application.

Information Disclosure Statement

2. The information disclosure statements filed 05/19/04 and 02/28/04 comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609. They have been considered and placed in the application file.

Drawings

3. Figure 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claim 16 is objected to because of the following informalities: Lines 2-3, "wherein the variable clock and selectively adds and subtracts" should read --wherein the variable clock selectively adds and subtracts--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Reinert (USP 6,539,489).

Regarding **claim 1**, in accordance with Reinert reference entirety, Reinert discloses a method for time synchronization (FIGs. 1A-1B) of field devices (FIG. 3; 202a-202n) on a network (FIG. 3; 203) of a distributed control system (FIG. 3), the method comprising:

transmitting periodically timing information (*master clock pulse*) from a master clock (FIG. 3; 201) to the field devices (FIG. 3; 202a-202n) over the network (FIG. 3; 203) of the distributed control system (FIG. 3) (*col. 7, lines 28-41*); and

adjusting (*phase compensated or time shifted*) an output clock signal frequency (*slave event start pulse 50a*) and a time stamp (*compensated Master Event Start Pulse 20a*) of each field device as a function of the periodically transmitted timing information and an output clock signal local to each field device (*col. 7, line 42 to col. 9, line 30*).

Regarding **claim 2**, in addition to features recited in base claim 1 (see rationales discussed above), Reinert further discloses wherein the step of adjusting comprises:

calculating a frequency ratio based upon the periodically transmitted timing information and the output clock signal (*FIG. 2d; T-MIN 41 and T-MAX 43 or the expectancy phase or time interval or window Tint 44 is calculated at col. 5, lines 50-51 and thereinafter*);

determining an add and a subtract parameter according to the frequency ratio (*FIG. 2D; T-ACT 42 and col. 5, line 63 and thereinafter*) ; and

varying an output of a variable clock using the add and the subtract parameters to produce the output clock signal (*FIG. 2F; +-PHASE ADJUSTMENT VARIABLE ΔT and col. 6, lines 53-58 and thereinafter*).

Regarding **claim 3**, in addition to features recited in base claim 1 (see rationales discussed above), Reinert further discloses wherein a period between transmission of the timing information varies (cable delay) (*col. 5, lines 1-48*).

Regarding **claim 4**, in addition to features recited in base claim 1 (see rationales discussed above), Reinert further discloses wherein the step of adjusting comprises:

determining adjustment parameters (*FIG. 2D; T-ACT 42 and col. 5, line 63 and thereinafter*);

generating the output clock signal with a nominal rate of one output pulse for every two input pulses of the fixed rate input clock signals (*FIG. 2d; T-MIN 41 and T-MAX 43 or the expectancy phase or time interval or window Tint 44 is calculated at col. 5, lines 50-51 and thereinafter*); and

adding and subtracting pulses from the output clock signal based upon the adjustment parameters (*FIG. 2F; +-PHASE ADJUSTMENT VARIABLE ΔT and col. 6, lines 53-58 and thereinafter*).

Regarding **claim 5**, in addition to features recited in base claim 1 (see rationales discussed above), Reinert further discloses wherein the time stamp of each field device is synchronized to the master clock so that reading from the time stamp does not require time scaling in software (*col. 6, lines 30-52*).

Regarding **claim 6**, in accordance with Reinert reference entirety, Reinert discloses a method of synchronization (FIGs. 1A-1B) of local sense of time of each of plurality of field devices (FIG. 3; 202a-202n) to a clock of a master field device (FIG. 3; 201) on a segment of a control network (FIG. 3; 203) using a time distribution data unit (master clock pulse), the method comprising:

detecting the time distribution data unit on the segment of the control network (*FIG. 1B; block 330 and col. 7, lines 43-65*);

calculating a frequency ratio between the local sense of time of a field device and a sense of time of the master field device (FIG. 1B; block 340 and col. 7, line 66 to col. 8, line 25); and

adjusting as necessary the sense of time of the field device according to the frequency ratio (*FIG. 1B; blocks 360-370 and col. 8, line 63 to col. 9, line 30*).

Regarding **claim 7**, in addition to features recited in base claim 6 (see rationales discussed above), Reinert further discloses testing the frequency ratio against boundary conditions of the field device (*FIG. 1B; block 360 and col. 8, line 64 to col. 9, line 3 and thereinafter*).

Regarding **claim 8**, in addition to features recited in base claim 6 (see rationales discussed above), Reinert further discloses wherein the step of adjusting comprises: adding and subtracting variable pulses from a sequence of clock pulses generated by a variable clock based upon the frequency ration (*FIG. 2F; +/-(PHASE ADJUSTMENT VARIABLE-ΔT)*)

Regarding **claim 9**, in addition to features recited in base claim 6 (see rationales discussed above), Reinert further discloses wherein the sense of time of the field device is maintained by an output clock signal (col. 8, lines 35-51 and thereinafter).

Regarding **claim 10**, in addition to features recited in base claim 6 (see rationales discussed above), Reinert further discloses wherein a frequency ratio equal to one results in no adjustment to the sense of time of the field device (*FIG. 1B; block 360 (YES) and col. 9, lines 4-30*).

Regarding **claim 11**, in addition to features recited in base claim 6 (see rationales discussed above), Reinert further discloses time stamping subsequently received data packets in hardware without having to scale a local sense of time in software (*col. 6, lines 42-45 and thereinafter*).

Regarding **claim 12**, in accordance with Reinert reference entirety, Reinert discloses a process control system having a common sense of time (*FIG. 3; master clock 201*), the system comprising:

a control network (FIG. 3; 203);

a time master device (*FIG. 3; 201*) in communication with a control network and having a master clock for generating a master clock signal, the time master device for periodically transmitting a time distribution data unit (*master clock pulse*) representative of the master clock signal (*col. 7, lines 28-30 and thereinafter*); and

a plurality of time slave devices (*FIG. 3; 202a-202n*) in communication with the control network, each time slave device having a local clock, and a time adjustment element (*FIG. 2F; element 80 or FIG. 4; element 660*) for adjusting the local clock according to a frequency ratio between the master clock signal and an output clock signal of the local clock (*col. 6, lines 40-52* or *col. 7, line 41 to col. 9, line 30*).

Regarding **claim 13**, in addition to features recited in base claim 12 (see rationales discussed above), Reinert further discloses wherein the time adjustment element is implemented in software (*col. 6, lines 42-45*).

Regarding **claim 14**, in addition to features recited in base claim 12 (see rationales discussed above), Reinert further discloses wherein the time adjustment element is implemented as a combination of hardware and software components (*col. 6, lines 42-45*).

Regarding **claim 15**, in addition to features recited in base claim 12 (see rationales discussed above), Reinert further discloses wherein the local clock includes a

fixed rate clock (FIG. 4; 663) for providing input clock pulses (xclkcy_165) and a variable clock (FIG. 4; 560 and 520) for producing the output clock signal (FIG. 4; 510) based upon the input clock pulses and adjustment inputs from the time adjustment element (FIG. 4; 660) (*col. 11, line 58 to col. 12, line 23*).

Regarding **claim 16**, in addition to features recited in base claim 15 (see rationales discussed above), Reinert further discloses wherein the time adjustment element (FIG. 27; block 80 or FIG. 4; block 660) calculates adjustment coefficients for use by the variable clock, and wherein the variable clock selectively adds and subtracts pulses from a sequence of pulses according to the adjustment coefficients (*Note: FIGs. 2A-2F show the clock signals and a phase compensating or time shifting the base or reference clock of the slave system 202a-202n by a phase adjustment variable 62 is disclosed at col. 6, lines 53-58 and thereinafter*).

Regarding **claim 17**, in addition to features recited in base claim 15 (see rationales discussed above), Reinert further discloses wherein the output clock signal is substantially synchronized with the master clock signal (*FIG. 2E and col. 6, lines 30-36 and thereinafter*).

Regarding **claim 18**, in accordance with Reinert reference entirety, Reinert discloses a method for reducing time processing cycles (FIGs. 1-4) in distributed field devices (FIG. 3; 202a-202n) of a process control network (FIG. 3; 203), the method comprising:

calculating adjustment coefficients for each field device according to a difference in frequencies between a local clock of each field device and a master clock of a time

master device on the process control network (*FIG. 1B; block 340 and col. 7, line 66 to col. 8, line 25*); and

adjusting a sense of time of each field device as needed to synchronize a sense of time of each field device with the time master device (*FIG. 1B; blocks 360-370 and col. 8, line 63 to col. 9, line 30*).

Regarding **claim 19**, in addition to features recited in base claim 18 (see rationales discussed above), Reinert further discloses transmitting a time distribution data unit from the time master to the distributed field devices before the step of calculating (*FIG. 1A; block 310 and the description at col. 7, lines 28-30 and thereinafter*).

Regarding **claim 20**, in addition to features recited in base claim 18 (see rationales discussed above), Reinert further discloses wherein a time stamp of each field device is synchronized to the sense of time of the field device such that reading a time value from the time stamp does not require scaling of the time value (*col. 7, line 42 to col. 9, line 30*).

Regarding **claim 21**, in addition to features recited in base claim 18 (see rationales discussed above), Reinert further discloses wherein the step of calculating adjustment coefficients comprises:

calculating a frequency ratio between the local clock of each field device and the master clock of a time master device (*FIG. 2d; T-MIN 41 and T-MAX 43 or the expectancy phase or time interval or window Tint 44 is calculated at col. 5, lines 50-51 and thereinafter*);

determining whether the frequency ratio is within adjustment boundary conditions (*FIG. 2D; T-ACT 42 and col. 5, line 63 and thereinafter*); and

calculating the adjustment coefficients as needed for adjusting frequency of the local clock (*phase adjustment variable 62 disclosed at col. 6, line 58 and thereinafter*).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Esker (USP 6,535,926).

Kaesdorf et al (USP 6,885,717).

Raja et al, Synchronous Model for Fieldbus Applications, IEEE, pages 525-529, 1993.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Frank Duong whose telephone number is 571-272-3164. The examiner can normally be reached on 7:00AM-3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema S. Rao can be reached on 571-272-3174. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Frank Duong
Primary Examiner
Art Unit 2666

May 05, 2005